

### **REMARKS**

Claims 1-20 are pending in this application, with claims 1, 7, and 14 being independent. Base claims 1, 7 and 14 have been amended to further define an aspect of Applicants' disclosed invention to distinguish over the cited prior art of record. As a result, entry of the foregoing remarks is proper under 37 C.F.R. §1.116(b) because no new issues are raised, no further search is required, and the foregoing remarks are believed to remove the basis of the outstanding rejections and to place all claims in condition for allowance.

Claims 1-2, 7-9 and 14-16 have been rejected under 35 USC 103(a) as being unpatentable over Ohe et al., U.S. Patent No. 5,600,464, as modified to incorporate selected features from Ota et al., U.S. Patent No. 5,831,707. In support of this rejection, the Examiner again asserts that Ohe '464, as a primary reference, discloses all the features, except for "an AC residual image which occurs even in a case of driving by pure AC that is less than 8%" which is alleged disclosed on column 9, lines 54-65 of Ota '707, secondary reference. Specifically, the Examiner asserts that,

"Ota teaches that in an in-plane switch LCD the use of AC driving (Applicant's driving by pure AC) reduces the residual image relative direct current operation (col. 9, lines 54-65) to achieve a display having perferrable quality. Note that Ota confirms the AC residual image would be less than the DC residual image that has already been made virtual zero by Ohe '464, therefore the combination meets Applicant's claimed range of less than 8%."

Ota is evidence that ordinary workers in the art of liquid crystals would find the reason, suggestion, or motivation to add driving by pure AC to achieve a display having preferable quality.

Actually, the Examiner's assertion is incorrect, and the cited column 9, lines 54-65 from Ota '707 is misplaced. Applicants respectfully submit that neither Ohe '994 nor Ota '707, discloses or suggests the features of Applicants' claims 1-2, 7-9

and 14-16. Therefore, Applicants respectfully traverse the rejection and request the Examiner to reconsider and withdraw this rejection for the following reasons.

For purposes of expedition, independent claim 1 has been amended to define a liquid crystal display device comprising a pair of substrates, a liquid crystal layer held between the pair of substrates, at least one of the pair of substrates being provided with a pair of electrodes for applying a lateral electric field to the liquid crystal layer, and **oriented films, free from side chain type structure**, formed on both of the pair of substrates, **wherein an AC residual image which occurs even in a case of driving by pure AC is less than 8%.**

Independent claim 7 has been amended to define a liquid crystal display device comprising a pair of substrates, a liquid crystal layer held between the pair of substrates, at least one of the pair of substrates being provided with at least a pair of electrodes for applying a lateral electric field to the liquid crystal layer, and at least **an oriented film, free from side chain type structure**, formed on the electrodes, **wherein an AC residual image which occurs even in a case of driving by pure AC is less than 8%.**

Likewise, independent claim 14 has been amended to define a liquid crystal display device comprising a pair of substrates, a liquid crystal layer held between the pair of substrates, at least one of the pair of substrates being provided with a pair of electrodes for applying a lateral electric field to the liquid crystal layer, at least a protecting film for protecting at least one of the pair of electrodes, and **oriented films, free from side chain type structure**, formed on both of the pair of substrates, at least one of the oriented films being arranged to cover the protecting film, **wherein an AC residual image which occurs even in a case of driving by pure AC is less than 8%.**

As expressly defined in each of Applicants' independent claims 1, 7 and 14, as long as "**an AC residual image**" is kept "**less than 8%**" even in case of driving by "pure AC", any display defect caused by the AC residual image in the lateral electric

field system can be eliminated. This phenomenon has been discovered solely by Applicants in an effort to reduce, if not eliminate, display defects caused by residual image in a liquid crystal display (LCD) device.

In order to appreciate Applicants' discovery in the context of a LCD device, the Examiner should note that the cause of residue image in conventional LCD devices is the application of DC voltage, and is **not** related to application of "pure AC". In other words, the residue image is caused by DC voltage. This is because the image sticking effect in conventional LCD device is related to the transmittance drift caused by DC voltage applied to liquid crystal cells. See page 79 of Electronics and Communications in Japan, Part 2, Vol. 78, No. 2, 1995. Because the residue image is caused by DC voltage, many researchers in the past have endeavored to adjust the application of DC voltage in order to reduce the residue image.

However, if AC is applied, there will be **no** residue image. As a result, many skilled in the art will not even consider the possibility that residue image can also occur based on "AC driving". However, as Applicants have discovered new phenomenon, and described in the disclosure that in special situations, that is, **only in a lateral electric field system**, residue image can still occur even in the case driven by "pure AC" at high temperature such as 55°C as disclosed on lines 20-25, page 2 of Applicants' specification. This is because **only in lateral electric field system**, liquid crystal molecules move, or rotate, in plane parallel to a substrate. The rotation motion strongly works to change alignment direction from rubbing direction and causes residual image. As a result, the key of solving residue image in such a lateral electric field system is a recognition that residue image does in fact occur even in the case driven by "pure AC".

Again, this type of residual image (Applicants' AC residual image) is new phenomena. Prior (DC) residual image tends to be improved at high temperature 55°C than 0-40°C as unexpected charge, which is the cause of prior residual image, decrease at high temperature. In contrast to prior (DC) residual image, AC residual

image tends to be worse at high temperature as described in connection with TABLE #2 on page 23 of Applicants' specification. Specifically, in TABLE #2, the comparative example #2 shows residual image being worse at 55°C than 0-40°C. This type of new residual image is **not** suggested in any of the cited prior art, including Ohe et al., U.S. Patent No. 5,600,464, and Ota et al., U.S. Patent No. 5,831,707.

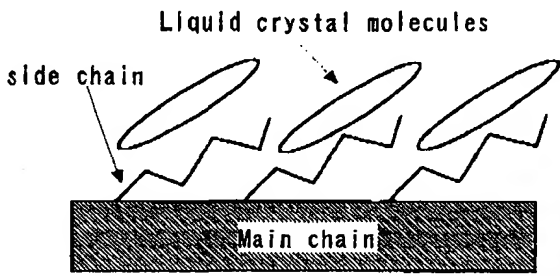
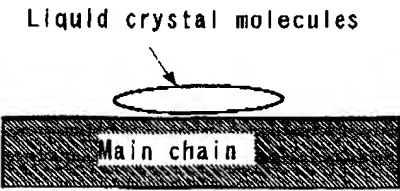
One of the solutions to improve this type of AC residual image, as discovered by the Applicants, is to use a specific type of **oriented film** as described on page 3, lines 6-8 of Applicants' specification. Specifically, on page 3, lines 6-8 of Applicants' specification,

"it has been found that coping with the display defect caused by the display unevenness, **it is effective to use a specific oriented film and increase an interaction between the oriented film and the liquid crystal molecules.**"

In other words, the AC residual image can be suppressed by improving the orientation controlling force of the oriented film as described on lines 7-8, page 11 of Applicants' specification.

Most effective technique of "increasing interaction between oriented film and liquid crystal molecules" and/or "improving orientation controlling force of oriented film" is to use **oriented film free from, or not having, side chain type structure.**

For the Examiner's convenience, below is an illustration of the use of an oriented film with side chain and without side chain type structure.

|   | with side chain  | free from side chain<br>(without side chain)  |
|---|--|---|
| Structure   |  |  |
| orientation<br>controlling<br>force                                 | Weak   | strong  |
| Tendensy to be<br>worse of residual<br>image at<br>high temperature | Strong   | Weak  |
| AC residual image   | Bad  | Good  |

As can be seen from the illustration, the side chain is protruded from main chain and very weak. In a side chain type oriented film, liquid crystal molecules are aligned to the side chain. Side chain is weak and easy to change direction when compared to the main chain. As a result, in the side chain type structure, interaction and orientation controlling force is very weak. In addition, the side chain is weak and easy to change direction at a high temperature as temperature makes side chain of oriented film soften. Therefore, this new residual image (AC residual image) tends to be worse at high temperature.

In an oriented film that is free from side chain type structure, as now defined in each of Applicants' base claims 1, 7 and 14, the liquid crystal molecules

are aligned to the main chain. As a result, interaction and orientation controlling force is very strong and can solve the AC residual image.

Again, none of the cited prior art, including Ohe et al., U.S. Patent No. 5,600,464, and Ota et al., U.S. Patent No. 5,831,707, discloses or suggests the new phenomenon of AC residual image or the use of **“an oriented film”** that is **“free from side chain type structure”**.

Another solution discovered by the Applicants is to maintain the “AC residue image” in such a lateral electric field system below a certain percentage, i.e., 8% as expressly defined in each of Applicants’ claims 1, 7 and 14. Other solutions are described in dependent claims 2-6, 8-13 and 15-20. For example, dependent claims 2, 8 and 16 further define that “a specific resistance of the liquid crystal layer is  $10^{10}$   $\Omega \cdot \text{cm}$  or more”. These features are **not** described or suggested by either Ohe ‘464 or Ota ‘707, whether taken individually or in combination with other references of record.

In order to establish a *prima facie* case of obviousness under 35 U.S.C. §103, the Examiner must show that the prior art reference (or references when combined) must teach or suggest all the claim limitations, and that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skilled in the art, to modify the reference or to combine reference teachings, provided with a reasonable expectation of success. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and **not** based on Applicants’ disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP 2143. In other words, all the claim limitations must be taught or

suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

"All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USQP 494, 496 (CCPA 1970). In addition, "obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." ACS Hospital System, Inc v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984).

The Examiner must point to something in the prior art that suggests in some way a modification of a particular reference or a combination of references in order to arrive at Applicants' claimed invention. Absent such a showing, the Examiner has improperly used Applicants' disclosure as an instruction book on how to reconstruct to the prior art to arrive at Applicants' claimed invention.

In the present situation, both Ohe '464 and Ota '707 (Applicants' earlier work products) fail to disclose or suggest all key features of Applicants' base claims 1, 7 and 14. Therefore, Applicants respectfully request that the rejection of Applicants' base claims 1, 7 and 14 and their respective dependents be withdrawn.

Nevertheless, the Examiner cites column 9, lines 54-65 of Ota '707 for allegedly disclosing the feature "wherein an AC residual image which occurs even in a case of driving by pure AC is less than 8%."

However, this citation is misplaced. The cited column 9, lines 54-65 of Ota '707 only refers that:

"the liquid crystal can be driven by an alternating current because a voltage ... can be charged and retain by making  $V_{TH} = 9.3$  V for exceeding the value... Further, a **residual charge** accumulated in the passivation film and other elements can be decrease and accordingly, an image display having a preferable quality without generating the residual image phenomenon can be realized."

According to Ota '707, residual image is caused by "**charge**". As a result, there is **no** residual image, if the liquid crystal is free from "**charge**". In other words, **no** residue image can be generated in "pure AC".

This is in contrast to Applicants' claimed phenomenon in which "residue image" can be generated even in a case of "pure AC" (even in charge-free condition). If anything, Ota '707 actually teaches away from Applicants' discovery of the phenomenon that residual image can be generated even in "pure AC".

Nonetheless, on pages 9-10 of the final Office Action (Paper No. 18), the Examiner asserts that there is **no** distinction between AC or DC residual image, and that Ota '707, as a secondary reference, teaches that the "DC residual image is related to the claimed application of pure AC."

This assertion is simply factually flawed. As previously explained, there is a world of differences between DC residual image (which is conventional) and AC residual image (which is the object of Applicants' disclosed invention). Ota '707 is Applicants' earlier work product, and as Applicants' earlier work product, Ota '707 does **not** disclose what the Examiner alleges, that is, the "DC residual image is related to the claimed application of pure AC."

In Ex parte Levy, 17 USPQ2d 1461, 1462 (1990), the court states that:

"it is incumbent upon the examiner to identify wherein each and every facet of the claimed invention is disclosed in the applied reference."

In addition, 37 CFR §1.106(b) requires the Examiner, when rejecting claims for want of novelty or for obviousness, must cite the best references at his command. When a reference is complex or shows or describes inventions other than that claimed by the Applicants, the particular part relied upon must be designated as nearly as



practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified. Any deficiencies of the cited references cannot be remedied by general conclusions about what is "basic knowledge" or "common sense". In re Sang Su Lee, No. 00-1158 (Fed. Cir. 2002).

In the present situation, unless the Examiner can cite to a specific part of Ota '707 to support the assertion that the "DC residual image is related to the claimed application of pure AC," the rejection of Applicants' base claims 1, 7 and 14 must be withdrawn.

Separately, claims 3, 10 and 17 have been rejected under 35 USC 103(a) as being unpatentable over Ohe et al., U.S. Patent No. 5,600,464, and Ota et al., U.S. Patent No. 5,831,707, as applied to claims 1-2, 7-9 and 14-16, and further in view of Mishina et al., U.S. Patent No. 5,350,539 for reasons stated on pages 5-6 of the final Office Action (Paper No. 18). In support of this rejection, the Examiner further cites Mishina '539 for disclosing the use of:

"at least 10 mol % (overlaps Applicant's 5% and at most 30%) of an alkyl group (col. 2, line 44 through col. 3, line 23) to provide low temperature heat treatment and stable alignment properties (col. 1, lines 5-9). Mishina also teaches that the alkyl group may be a long-chain alkyl group in order to raise the tilt angle (col. 5, lines 23-25).

However, the citation is misplaced. Dependent claims 3, 10 and 17 further define that "at least one of the **oriented films** is an **organic polymer** containing at least one of a polymer and an oligomer in which a weight substance with a long-chain alkyl group applied to an amine component or an acid sentence is at least 5% and at most 30% of the total molar amount". As a result, even assuming that Mishina '539 discloses what the Examiner alleges, there is **no** disclosure or suggestion that the "oriented films" are made of "an **organic polymer** containing at least one of a polymer and an oligomer in which a weight substance with a

long-chain alkyl group applied to an amine component or an acid sentence is at least 5% and at most 30% of the total molar amount” as expressly defined in Applicants’ dependent claims 3, 10 and 17. Therefore, in view of the foregoing deficiencies inherent with the Examiner’s proposed combination, Applicants respectfully request that the rejection of Applicants’ claims 3, 10 and 17 be withdrawn.

Lastly, claims 4, 5, 6, 11-13 and 18-20 have been rejected under 35 USC 103(a) as being unpatentable over Ohe et al., U.S. Patent No. 5,600,464; Ota et al., U.S. Patent No. 5,831,707; Mishina et al., U.S. Patent No. 5,350,539 as applied to claim 3 above, and further in view of Yu et al., U.S. Patent No. 6,066,696 for reasons stated on pages 5-6 of the final Office Action (Paper No. 18). In support of this rejection, the Examiner asserts that Yu ‘696 teaches:

“the use of 1% to 20% (by weight, col. 5, lines 14-21) of a polyimide having an alkyl group at both ends (Applicant’s terminal type) (col. 2, lines 32-60) with a molecular weight of  $5 \times 10^3$  to  $5 \times 10^5$  (col. 5, lines 21-28) (overlaps Applicant’s 2000 and at most 30,000) for improved optical alignment and thermal stability (col. 5, lines 19-21)

Again, the citation is misplaced. Dependent claims 4, 11 and 18 further define that the **oriented films** are **organic polymer** and that “a weight average molecular weight of the polymer and the oligomer is at least 2,000 and at most 30,000.” Likewise, dependent claims 5, 12 and 19 further define that “the polymer and the oligomer contain a long-chain alkylene group of at least one of a main chain type and a terminal type.” Again, these limitations are **not** described or suggested by either Ohe ‘994, Ota ‘707, Mishina ‘539 or Yu ‘696, whether taken individually or in combination with other references of record.

Similarly, dependent claims 6, 13 and 20 further define that “at least one of the oriented films is an organic polymer of a polymer and/or oligomer amic acid imide type, a polymer and/or oligomer amide-imide type, a polymer and/or oligomer imidosiloxane type, or a polymer and/or oligomer amide-imide type containing a

long-chain alkylene group.” Again, this limitation is **not** described or suggested by either Ohe ‘994, Ota ‘707, Mishina ‘539 or Yu ‘696, whether taken individually or in combination with other references of record.

Entry of the foregoing amendments is proper under 37 C.F.R. §1.116(b) because those amendments simply respond to the issues raised in the final rejection, no new issues are raised, no further search is required, and the foregoing amendments are believed to remove the basis of the outstanding rejections and to place all claims in condition for allowance. The foregoing amendments, or explanations, could not have been made earlier because these issues had not previously been raised.

In view of the foregoing amendments, arguments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicants’ attorney at the Washington DC area office at (703) 312-6600. Applicants respectfully reserve all rights to file subsequent related application(s) (including reissue applications) directed to any or all previously claimed limitations/features which have been amended or canceled, or to any or all limitations/features not yet claimed, i.e., Applicants have no intention or desire to dedicate or surrender any limitations/features of the disclosed invention to the public.

**INTERVIEW:**

In the interest of expediting prosecution of the present application, Applicants respectfully request that an Examiner interview be scheduled and conducted. In accordance with such interview request, Applicants respectfully request that the Examiner, after review of the present Amendment, contact the undersigned local Washington, D.C. area attorney at the local Washington, D.C. telephone number (703) 312-6600 for scheduling an Examiner interview, or alternatively, refrain from

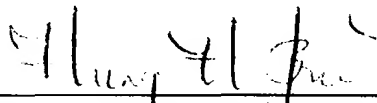
issuing a further action in the above-identified application as the undersigned attorneys will be telephoning the Examiner shortly after the filing date of this Amendment in order to schedule an Examiner interview. Applicants thank the Examiner in advance for such considerations. In the event that this Amendment, in and of itself, is sufficient to place the application in condition for allowance, no Examiner interview may be necessary.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (1113.40340X00).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

By

  
Hung H. Bui (Reg. No. 40,415)  
Attorney for Applicant(s)

HHB:btd

1300 North Seventeenth Street, Suite 1800  
Arlington, Virginia 22209  
Tel.: (703) 312-6600  
Fax: (703) 312-6666